Multi-layer laminate for tubes and similar foil-type packaging, having an embedded barrier layer

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## Patent claims

- 1. Multi-layer laminate for tubes and similar foil-type packaging having an embedded barrier layer (30), a metal especially aluminium foil (60) and optionally an outer structure, especially an outer and/or sealing film (70),
- 10 characterised in that
  the barrier layer (30) consists of one or more, especially mixtures, of the following
  materials:
  - polyamide (PA), especially aromatic and/or partly aromatic polyamide or mixtures thereof,
  - mixtures of polyamide (PA), especially aromatic and/or partly aromatic
    polyamide or mixtures thereof, with ethylene vinyl alcohol copolymer (EVOH)
    and/or polyacrylonitrile (PAN),
    - polyethylene terephthalate (PET),
    - polyacrylonitrile (PAN).

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- 2. Laminate according to claim 1,
  - characterised in that
  - the barrier layer (30) is arranged on the inside of the packaging, between an inner sealing or contact layer (10) and the metal foil or layer (60), especially as part of an inner film (80).
- 3. Laminate according to one of claims 1 or 2, characterised in that there is provided, between the barrier layer (30) and the metal foil (60), a central sealing layer (40) and/or an especially extruded connecting layer (50).

4. Laminate according to one of the preceding claims, characterised in that an adhesion promoter (20) is provided between the barrier layer (30) and the layers surrounding the barrier layer (30), especially the inner sealing layer (10) and an outer layer.

- 5. Laminate according to one of the preceding claims,
   characterised in that
   the metal especially aluminium foil (60) is coated with a chromium-complex comprising, especially lacquer-like, material.
  - 6. Laminate according to one of the preceding claims, characterised in that the particular layers have thicknesses in accordance with the following table:

Especially Preferred layer Layer thickness Layer preferred layer thickness thickness 5 μm - 100 μm 1 µm - 250 µm 3 μm - 150 μm Inner sealing or contact layer (10) 5 μm - 25 μm Adhesion promoter (20) 1 µm - 140 µm 3 μm - 40 μm 3 μm - 50 μm 1 μm - 180 μm 2 μm - 80 μm Barrier layer (30) 5 μm - 100 μm 1 μm - 250 μm 3 μm - 150 μm Central sealing layer (40) 5 μm - 50 μm Connecting layer (50) 1 μm - 180 μm 3 µm - 80 µm 1 μm - 150 μm 3 µm - 65 µm 5 µm - 40 µm Metal foil (60) 1 μm - 190 μm 1 μm - 110 μm Outer structure (70) 1 μm - 300 μm

7. Laminate according to one of the preceding claims, characterised in that the particular layers comprise materials in accordance with the following table, in each case singly or in combination:

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Layer	Material(s)
Inner sealing or contact	Polyethylene (PE), polypropylene (PP), modified
layer (10)	olefins, especially ionomers, ethylene acrylic acid
	(EAA), polyacrylonitrile (PAN), ethylene methacrylate
	(EMA), mixtures of afore-mentioned materials
Adhesion promoter (20)	Maleic anhydride (MA), modified olefins, especially
	ionomers, mixtures of afore-mentioned materials
Central sealing layer (40)	Polyethylene (PE), polypropylene (PP), modified
	olefins, especially ionomers, ethylene acrylic acid
	(EAA), polyacrylonitrile (PAN), ethylene methacrylate
	(EMA), mixtures of afore-mentioned materials
Connecting layer (50)	Ethylene acrylic acid (EAA), ethylene methacrylate
	(EMA), maleic anhydride (MA), modified olefins,
	especially ionomers, polyethylene (PE), mixtures of
	afore-mentioned materials
Outer structure (70)	Polyethylene (PE), polypropylene (PP), modified
, ,	olefins, especially ionomers, ethylene acrylic acid
	(EAA), polyacrylonitrile (PAN), ethylene methacrylate
	(EMA), colorants, mixtures of afore-mentioned
	materials

- 8. Method of producing a multi-layer laminate for tubes and similar foil-type packaging having an embedded barrier layer (30), a metal especially aluminium foil (60) and optionally an outer structure (70), especially an outer and/or sealing film (70), characterised in that as the barrier layer (30) there is used
  - polyamide (PA), especially aromatic and/or partly aromatic polyamide or mixtures thereof,
  - mixtures of polyamide (PA), especially aromatic and/or partly aromatic polyamide or mixtures thereof, with ethylene vinyl alcohol copolymer (EVOH) and/or polyacrylonitrile (PAN),
  - polyethylene terephthalate (PET),
  - polyacrylonitrile (PAN).

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9. Method according to claim 8, characterised in that an inner film (80) consisting of at least a sealing or contact layer (10, 40) and the barrier layer (30) and at least one adhesion promoter (20) arranged between the barrier layer (30) and the sealing or contact layer (10, 40) is co-extruded.

10. Method according to claim 8,

characterised in that

the barrier layer (30) is produced in the form of a film and applied to an inner sealing or contact layer (10) by means of extrusion lamination or adhesive lamination.

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11. Method according to claim 8,

characterised in that

the inner sealing or contact layer (10), the barrier layer (30) and, optionally, a central sealing or contact layer (40) are applied directly onto the metal layer (60), where appropriate using an adhesion promoter (20), especially a primer, preferably a methacrylate.

12. Method according to one of claims 8 to 11,

characterised in that

the metal - especially aluminium - foil (60) is coated with a chromium-complexcomprising, especially lacquer-like, material.

13. Method according to one of claims 8 to 12,

characterised in that

the particular layers are produced having thicknesses in accordance with the following table:

Layer	Layer thickness	Preferred layer thickness	Especially preferred layer thickness
Inner sealing or contact layer (10)	1 μm - 250 μm	3 μm - 150 μm	5 μm - 100 μm
Adhesion promoter (20)	1 μm - 140 μm	3 μm - 40 μm	5 μm - 25 μm
Barrier layer (30)	1 μm - 180 μm	2 μm - 80 μm	3 µm - 50 µm
Central sealing layer (40)	1 μm - 250 μm	3 μm - 150 μm	5 μm - 100 μm
Connecting layer (50)	1 μm - 180 μm	3 μm - 80 μm	5 µm - 50 µm
Metal foil (60)	1 μm - 150 μm	3 μm - 65 μm	5 μm - 40 μm
Outer structure (70)	1 μm - 300 μm	0 μm - 190 μm	0 μm - 110 μm

14. Method according to one of claims 8 to 13,

characterised in that

the particular layers are produced with materials in accordance with the following table:

Layer	Material(s)
Inner sealing or contact layer (10)	Polyethylene (PE), polypropylene (PP), modified olefins, especially ionomers, ethylene acrylic acid (EAA), polyacrylonitrile (PAN), ethylene methacrylate (EMA), mixtures of afore-mentioned materials
Adhesion promoter (20)	Maleic anhydride (MA), modified olefins, especially ionomers, mixtures of afore-mentioned materials
Central sealing layer (40)	Polyethylene (PE), polypropylene (PP), modified olefins, especially ionomers, ethylene acrylic acid (EAA), polyacrylonitrile (PAN), ethylene methacrylate (EMA), mixtures of afore-mentioned materials
Connecting layer (50)	Ethylene acrylic acid (EAA), ethylene methacrylate (EMA), maleic anhydride (MA), modified olefins, especially ionomers, polyethylene (PE), mixtures of afore-mentioned materials
Outer structure (70)	Polyethylene (PE), polypropylene (PP), modified olefins, especially ionomers, ethylene acrylic acid (EAA), polyacrylonitrile (PAN), ethylene methacrylate (EMA), colorants, mixtures of afore-mentioned materials